

INTERNATIONAL JOURNAL OF ECONOMICS AND FINANCE STUDIES

Vol 10, No 2, 2018 ISSN: 1309-8055 (Online)

PREDICTING STUDENT SUCCESS IN PUBLIC ECONOMICS

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—Abstract—

Student performance in public economics and consequently microeconomics as pre-requisite can improve with the correct pedagogic intervention. This paper proposes an empirical model that investigates the factors or predictors that may best explain the success rate in the subject field. The model has been designed according to existing studies and adjusted to support the discussion behind the success rate of public economics students at third year level. The dependent variable is effectively the final mark reached, whilst using a dummy variable to indicate pass or failure. The coefficients or explanatory variables include the age of the student, the assignment marks, whether studying full-time or not, gender, home language, the final mark of the pre-requisite microeconomics first and second-year-level together with the number of repeats of the latter. The methodology supports an ordinary least squares regression analysis, but because of binary data, a binary logit model is also investigated. The results suggest that the final course mark of first year level and especially second year level have a significant impact on the final mark of third year Public Economics. This was to be expected in the sense that the Public Economics content is Microeconomic based. A higher mark for the assignments during the year also usually results in a higher final mark for the student. Studying in the home language tends to benefit the student, although a third-year student tends to be more senior and mature in

their studies. Age seems to become a factor because a significant gap between second and third year studies tends to develop, and potentially has a negative impact on the final results. Part-time students tend to perform better, with the student possibly more resourceful in terms of facilities and time management. It was found that the more the student repeated Public Economics in previous years of study, the probability to pass Public Economics decreased. The more they repeated second-year Microeconomics, their probability of passing Public Economics also got lower. This coincides with the final marks variable as dependent variable. The results may, amongst others, promote a more efficient, effective and economic e-learning environment, and may further assist in guiding other tertiary institutions with the challenges arising within the open distance learning arena.

Key Words: Public economics, microeconomics, student success, pedagogic intervention

JEL Classification: A22

1. INTRODUCTION

Public economics is a compulsory module at third year level Bachelor of Commerce (Economics) and an elective module in Bachelor of Commerce Honors (Economics) at the University of South Africa (UNISA). Low success rates at South African higher education institutions instigated renewed interest in the predictors of academic achievement (Keeve, Naude and Esterhuyse, 2011: 121). The success rate of public economics students at UNISA has been varied, and compulsory modules, such as introductory microeconomics at first year level and microeconomics at second year level, should have a direct impact on the success rate in the third year, due to the relevance of content. Numerous international studies have been conducted on student performance, specifically for microeconomics students. Less research has been done in a South African context, especially within an open distance learning environment (ODL). This

type of research is normally undertaken because microeconomics is a compulsory module at most universities for the Bachelor of Commerce and it has a direct impact on the throughput and subsidy to these universities. This study investigates Public Economics due to its importance as compulsory module in graduating with a Bachelor of Commerce in Economics.

This paper seeks to contribute to existing knowledge and aims in the following ways: Firstly, the study attempts to compare performance drawn from the Public Economics third year level module, with the determinants of the success rate as the dependent variable, and secondly, the study tests the impact of first-year and second-year microeconomics on Public Economics students' performance. Thirdly, the study investigates the possibility of repeated candidates progressing to the next level. Lastly, we capture pedagogic intervention such as those undertaken in public economics as third year module in an open, distance and online environment.

2. THEORETICAL BACKGROUND

The so-called 'third wave' of distance education (DE) (Peter, 2010) is driven by globalisation and the information age, along with an increased demand for knowledge workers. The evolving Internet and a digital learning environment changed DE further. Asynchronous and synchronous forms of communication in one place now became possible. Online learning has become available to anyone with a computer and access to the Internet. Corporate universities and virtual schools developed to feed the demand for lifelong learning. The rise of the "challenge-driven university" has changed the face of education in which projects by students are sponsored by companies as well as the instructors (Anon, 2016). The 'fourth wave' in DE (Peters, 2010) brought exciting new theories to the fore with a changing role for both the instructor and the student. Teaching and learning have changed considerably with the student increasingly becoming self-directed and the lecturer or instructor using various online tools, such as additional material, i.e. video clips (vodcasts) and self-assessments to reach the student. Kitzito (2016) emphasises the role of the necessary infrastructure and the

willingness of the student to engage within an online environment. Mobile phone technology for online use is becoming the solution for emerging economies.

2.1 Connectivism and self-directed learning

The theory of connectivism is a recent addition, with online learning becoming a self-directed activity. Heutagogy (knowing how and where to learn) explains self-determined learning, expanding on andragogy, in which the learner decides the path of learning (Hase & Kenyon, 2000). In a heutagogical approach to teaching and learning, learners are highly autonomous and self-determined and emphasis is placed on development of learner capacity and capability with the goal of producing learners who are well-prepared for the complexities of today's workplace. Learning occurs as a result of creating environments or networks (Siemens, 2005). However, lecturers and instructors still need to place the needs of the student first, as many may not yet be prepared for self-directed learning. Greater empathy and instant feedback from the instructors will ensure students remain inspired and focused. Connectivism, especially at graduate level, brings most things together, although the role of behaviourism, cognitivism and constructivism should not be ignored (Siemens, 2005).

Conradie (2014) explored whether self-directed learning takes place through connectivism within personal learning environments. Although andragogy, behaviourism, cognitivism and constructivism all rely on the learner's know-how, connectivism goes a step further and involves an active learner engaging in learning through systems and networks and the know-where. Self-directed learning thus refers to an active learner designing his/her own learning path through e-learning or Web 2.0 participation and collaboration between learner and teacher or tutor. As part of the methodological analyses, 76 participants in an Information and Communication Technology class were included. Interviews were conducted with open- and closed-ended questions in terms of motivation, engagement, collaboration and self-actualisation. The main idea was to establish whether connectivism leads to more motivated learners, higher engagement by learners, facilitating more collaboration between learners and more encouraged learners. The main findings showed that learners were motivated and engaged supported by collaboration and self-actualisation. The learners did however find

the self-direction challenging – especially in the beginning when more training became essential. Self-direction can thus become a factor that predicts student success although not always measurable without questionnaires.

In the current context, it was fitting to explore, firstly, the factors that best explain the success rate of students. The closest example relating to the current context is student performance in Economics and the effect of expertise in related subjects (Wagemans et al., 1991). In relation to the influence of prior knowledge on the acquisition of subject- oriented knowledge, their regression analysis revealed that expertise accounted for 37–42% of the variance in post- test scores. This relates to the focus in the current study where the influence of second-year modules as pre-requisites was also tested. Du Plessis, Müller, and Prinsloo (2005) first investigated the profile of a first-year Accounting student and the factors that influence the performance of these students in the open distance learning (ODL) context. Another close comparison is that of the first-year Economics student by Pretorius et al. (2009: 140) in an ODL environment, where the researchers found that the successful passing of assignments had the greatest influence on student success, with language and age also playing a role. Success-predicting tools have also been designed to assist with the identification of prospective MBA students (Bisschoff, 2005).

Some attention has been given to academic development and pedagogic intervention as tools to improve results. Smith and Edwards (2007: 99) suggest that an academic development preparation course has a major influence on students' performance in first- and second-year Microeconomics. Matriculation results, Mathematics, English as first language, Physical science and gender were all important determinants of performance. Smith (2009) further found that pedagogic interventions have a positive influence on the performance of students. The key variables that may explain the relative success of such intervention in the academic development course were economic, language and communication tutorials, essay writing, the module designed to develop students' quantitative and graphical skills, and smaller class sizes. Improved performance by the mainstream cohort may be ascribed, amongst others, to a more intensive tutorial system. Keeve et al. (2011: 121) found that for three-year-curriculum students, academic factors such as Grade 12 performance and language proficiency provide a

significant explanation. These factors do not apply to four-year-curriculum students, where psychosocial factors may play a role. Smith and Ranchhod (2012: 431) later conclude that educational interventions in the first year had a positive influence on academic performance. Their results further suggested that educational interventions introduced later, in the form of voluntary workshops, improved academic performance further.

Further international studies have been conducted in student success in Economics. Athey, et al. (2007: 517) investigated graduate economics education and student outcomes. They found that first-year grades in required core courses were a strong predictor of Economics graduate students' job placements. First-year Micro- and Macroeconomics grades were statistically significant predictors of student job placement. One explanation is that these courses directly help to prepare students to be successful researchers. Students could also gain self-confidence or create positive 'first impressions' with faculty members. Foreign-trained and male students achieved higher first-year grades on average than their female counterparts.

When considering more recent international research, it was found that online recorded lectures improved Taiwanese students' performance by 3 to 5 percentage points on average (Chen & Lin, 2012: 6): This finding is significant, because e-learning interventions such as vodcasts could bridge the gap and provide the necessary knowledge that students may otherwise lack. We therefore also looked at the effect of e-learning tools, such as vodcasts, on examination performance and/or final marks of students in specifically public economics.

In later studies, self-regulation and the role of motivation and emotion in online learning were also seen (Cho & Heron, 2015). Further, Risenga (2010: 85) found that within an ODL institution, there is a strong correlation between exogenous variables such as students' willingness to succeed in their studies and work environment. Variables indigenous to the institutions, such as understandability and clarity of examination papers and study materials, were also found to influence students' performance significantly. The findings suggest that higher education institutions should adapt a holistic and inclusive approach in the design

and implementation of measures aimed at facilitating students' performance and circumventing challenges hampering their success.

3. PUBLIC ECONOMICS AT UNISA: THE DATA

Public Economics at B.Com. final year level in economics are offered as a compulsory module. Microeconomics at second year level serves as pre-requisite for public economics. Public Economics at third year level is offered as a compulsory module. Microeconomics at second year level serves as pre-requisite for Public Economics. The data for the empirical analysis drew on the first- and second semester registrations for 2013 and 2014. These samples comprised approximately 700 students. With a low pass rate, research and understanding of contributing factors, together with potential solutions for assistance and improvement has become important.

The subject matter of public economics third year level is challenging to students. It is an applied microeconomics discipline and students sometimes struggle, because their knowledge and comprehension of second-year microeconomics may not suffice. The student needs to gradually progress to the next level though the successful understanding and mastering of earlier material. The combined weight of the assignments was 20%, with the examination contributing the remaining 80%. The subject matter of Public Economics third year level is challenging to students. It is an applied microeconomics discipline and students sometimes struggle, because their knowledge and comprehension of second-year Microeconomics may not suffice. The student needs to gradually progress to the next level though the successful understanding and mastering of earlier material. With a low pass rate, research and understanding of contributing factors, together with potential solutions for assistance and improvement has become critical.

3.1 Profile of students

The group comprises mainly males (see Table A.1 and A.2, Annexure), with a mean age of approximately 31, and where students did mostly not study in their home language. UNISA has two official languages of instruction, English and Afrikaans. The home language is included in the analysis as a reliable indicator of student success. Students that were unemployed or not economically active were regarded as full time students. Those that were not classified were included as part-time students. Within the ODL tuition and delivery framework, students only need to submit two assignments during the semester and no tests are written. For the purposes of this study, the handing in and passing of the two multiple-choice assignments were taken as showing effort and commitment on the part of the student.

3.2 Empirical methodology and model specifics

In order to assist the student, we needed to understand the determining factors in terms of student performance.

The model was mainly based on existing studies (Pretorius, Prinsloo and Uys, 2009) but adjusted to support the success rate of Public Economics students at third year level, namely:

$OUTPUT\ Final_mark_Ecs3 = f(Age, N_Ass_1, Ass_1, Dum_fulltime, Dum_HL, Dum_male, Final_mark_ECS1, Final_mark_ECS2).$

The dependent variable is effectively the final mark reached, whilst using a dummy variable to indicate pass or failure.

The coefficients, or explanatory variables, consist of the following: Age, assignment marks, dummy time variable ('Dum_fulltime', with a value of 1 for full-time study, else 0), dummy language variable ('Dum_HL', with a value of 1 for study in home language, else 0), dummy gender variable ('Dum_male', with a value of 1 if for male, else 0 if female); final mark reached in micro 1, final mark reached in micro 2.

Table 1: Description of variables for Public Economics

Dependent variables	
Finalmark_ECS3	Final mark scored by the student in Public Economics 3
Dum_Final	Taking a value of 1 if passed and 0 if failed
Explanatory variables	
Age	Age of the student
Assignment_1	Mark of assignment 1
Assignment_2	Mark of assignment 2
Finalmark_ECS1	Final mark in Microeconomics 1
Finalmark_ECS2	Final mark in Microeconomics 2
Repeat_ECS1	Number of times repeated Microeconomics 1
Repeat_ECS2	Number of times repeated Microeconomics 2
Dum_HL	Taking a value of 1 if studying in home language and 0 if not
Dum_Male	Taking a value of 1 for male students and 0 for females
Dum_full	Taking a value of 1 for full time students and 0 for part time

Table 2: Ordinary least squares with finalmark Public Economics as dependent

Variable	Coefficient (2013)	Prob.	Coefficient (2014)	Prob.
C	5.413997	0.4256	2.754277	0.6343
FINMRK_ECS2	0.270424	0.0049	0.341117	0.0000
FINMRK_ECS1	0.356849	0.0000	0.274414	0.0001
REPTS_ECS1	-0.689490	0.4573	-0.965019	0.2211
REPTS_ECS2	-2.360518	0.0003	0.070439	0.9078
DUM_FULL	-2.396726	0.1271	-6.351152	0.0000
DUM_HL	4.161143	0.0077	-1.378711	0.3346
DUM_MALE	0.699883	0.6155	0.330814	0.8025
AGE	-0.244020	0.0133	-0.190912	0.0316
ASS 1	0.100956	0.0010	0.192202	0.0000
ASS 2	0.146511	0.0000	0.132208	0.0000
R-squared	0.228863	0.4256	0.244474	
Observations	643		712	

The low predictive power or R-squares of the regressions can be explained by the fact that this study focused on student-specific factors only, and thus ignored the characteristics of the specific institution, the impact of curriculum choices, and the impact of the characteristics of the staff involved in teaching, including e-learning solutions, that may almost certainly also have an impact on student success (see Pretorius, Prinsloo, and Uys, 2009: 152).

The results suggest that the final marks of ECS1 and especially ECS2 have a significant impact on the final mark of ECS3. This was to be expected in the sense that the ECS3 content is Microeconomic based. The first-year level result coincides with the findings of Athey, Katz, Krueger, Levitt and Poterba (2007:512), in the sense that it is the core course or module for an Economics graduate student. The better the student perform in the assignments, the better the final mark of the student. Although home language can be considered as a contributor, it is not consistent year on year, due to the fact that a third-year

student is a senior and more mature student in their studies. Indeed, many of the students can be considered as studying part-time and it is possible that they are active within an environment where English is the main language of communication. Full time students tend to perform poorly in terms of final marks whilst part-time students tend to fair better. It therefore seems appropriate to conclude that the more a student has to do, the more the student gets done. Age seems to become a factor, to the extent that the older the student becomes the lower the final marks achieved. These finding coincide with findings as already mentioned in the theoretical background such as Pretorius et al. (2009).

3.3 Binary logit results

$OUTPUT\ Dum_final = f(Repeats, Repeat_ECS1, Repeat_ECS2, Age, N_Ass_1, Ass_1, Dum_fulltime, Dum_HL, Dum_male)$.

The dependent variable is the dummy final mark, which takes a value of 1 when ECS3 was passed and 0 when it was failed. Table 3 shows the binary logit results. The results of the binary logit models are interpreted differently from the OLS results. The direction of the effect of a change depends on the sign of the estimated coefficient. Positive values imply that increases in the explanatory variables will increase the probability of the student passing the module, while negative values imply that increases in the explanatory variables will decrease the probability of the student passing. It was found that the more the student repeated Public Economics in previous years of study, the probability to pass Public Economics decreased. The more they repeated second-year Microeconomics, their probability of passing ECS3 got lower. The assignments are important and the better they perform in the assignments, the better their chances to pass ECS3. Although inconsistent year on year, home language could still be considered a factor, which tends to affect their chances of passing ECS3.

Table 3: Binary logit results with Dum_Final of Public Economics as dependent variable

Variable	Coefficient (2013)	Prob.	Coefficient (2014)	Prob.
C	1.817988	0.0000	-0.437479	0.2207
REPEATS	-2.438567	0.0000	-0.741998	0.0000
REPTS_ECS1	0.176145	0.2189	-0.034761	0.7336
REPTS_ECS2	-0.211410	0.0667	-0.029002	0.7214
DUM_HL	0.843319	0.0005	0.107876	0.5687
DUM_MALE	0.308493	0.1427	0.261599	0.1325
DUM_FULLTIME	0.151004	0.4791	-0.795945	0.0000
ASS1_	0.006304	0.1829	0.024741	0.0000
ASS2_	0.020497	0.0000	0.015852	0.0003
MacFadden R-Squared	0.354164		0.166771	
Observations	643		712	

The more the student repeats Public Economics and second year Microeconomics, the less their chances of passing ECS3. This coincides with the final marks variable as dependent variable. The assignments are important, where the better they perform in the assignments, the greater their chances of passing ECS3. These findings coincide with studies as mentioned in the theoretical background.

4 PEDAGOGIC INTERVENTION

In terms of pedagogic intervention, the results of this study indicate that the success of students in Public Economics depends much more on the final results of first- and second-year level Microeconomics. It will therefore be advisable to

include remedial interventions on especially third-year level modules such as revision and review (activity sheets and online activities), in addition to e-learning solutions, such as podcasts for video clips. UNISA has also implemented progression rules in 2015, to ensure that students complete their studies within a certain time limit.

By extending the analysis to Honors level and through a comparative analysis of different universities' graduate students, the degree compilation of the Department of Economics at UNISA could be benchmarked.

5 CONCLUSION

The intention was to explore the factors that explain the success rate of public economics third year level students and how the microeconomics module as pre-requisite contributes towards their success. The results suggest that the final marks of ECS1 and especially ECS2 have a significant impact on the final mark of ECS3. This was to be expected in the sense that the ECS3 content is Microeconomic based. Additionally, higher marks for the assignments results in a higher final mark of the student. Home language appears to improve the chances of the student to pass ECS3, although by that stage, the student is also more senior and mature with respect to their studies. Age becomes a factor in that a significant gap between second and third year develops over time. Part-time students also appear to achieve better final marks for ECS3, where available facilities and improved management of time may contribute.

From the analysis it appears that the more the student repeats third year Public Economics and second year Microeconomics, the less their chances of passing the third year ECS3 module. This coincides with the final marks variable as dependent variable. The assignments are important in that the better they fair in the assignments, the more their chances of passing ECS3.

Challenges faced and issues arising may include pedagogic interventions such as academic development programmes, but also assisting with a more efficient, effective and economic ODL e-learning environment. More targeted online

interventions should assist with future studies. Future studies could also expand the analysis to honours level students.

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Annexure

Variable	Observation	Mean	Standard Deviation	Min	Max
FINALMRK	643	43.56	19.42	2	93
FINMRK_ECS1	643	55.69	7.86	50	89
FINMRK_ECS2	643	59.80	10.85	50	93
REPTS_ECS1	643	0.84	0.81	0	8
REPTS_ECS2	643	1.01	1.16	0	8
DUM_FULL	643	0.59	0.49	0	1
DUM_HL	643	0.30	0.46	0	1
DUM_MALE	643	0.53	0.50	0	1
AGE	643	33	8.03	22	60
ASS 1	643	48.80	22.88	10	100
ASS 2	643	51.64	23.36	10	100
OTHER_ MODULES	643	6.53	3.98	0	19

Table A.1: Descriptive statistics for 2013

Variable	Observations	Mean	Standard Deviation	Min	Max
FINALMRK	712	45.83	19.22	0	93
FINMRK_ECS1	712	57.83	9.54	50	97
FINMRK_ECS2	712	59.20	10.59	50	96
REPTS_ECS1	712	0.68	0.89	0	8
REPTS_ECS2	712	0.81	1.16	0	8
DUM_FULL	712	0.48	0.50	0	1
DUM_HL	712	0.31	0.46	0	1
DUM_MALE	712	0.56	0.50	0	1
AGE	712	32	8.26	20	70
ASS 1	712	52.96	20.84	10	100
ASS 2	712	51.54	21.29	10	100
OTHER_ MODULES	712	8.80	4.82	0	20

Table A.2: Descriptive statistics for 2014